

Swanson, Greg

From: Sims, Joe
Sent: Wednesday, May 02, 2001 9:23 AM
To: Swanson, Greg; Finnegan, Charles; Meyers, Charles
Cc: Popp, Chris; Wood, David
Subject: COPV Venting and Reusability

Good morning,

I have a concern/question I'd like to run by the three of you to calibrate my thinking a little bit, and to get you guys thinking about an issue that may be coming to a head sometime in the next few months. This issue will almost certainly be heard by and dealt with by the Fracture Control Board; I hope your early involvement will make this easier on all involved. Recall I sent you an e-mail (at least to Mr. Finnegan and Mr. Meyers) a few days back asking about leak before burst failure modes in COPVs.

A little background: in this upgrade for the SRB, we'll be replacing a low-pressure, all-metallic pressure vessel hydrazine system with a set of high-pressure, COPVs filled with helium. The high pressure helium will be used to drive the APUs which provide power for the thrust vector control subsystem. The entire TVC subsystem (eventually including the upgrade hardware) is contained within the aft skirt. Overall, it's a nice, neat upgrade, but I do have a concern with current plans on how the COPVs will be used.

Right now, the plans are to make the COPVs single mission components that will be scrapped following each mission. Now, all of the helium in the tanks will not be used in a single nominal mission, and in cases where we lose one APU (i.e., let's say an isolation valve failed closed right at liftoff), half of the tanks (3 each for the rock and tilt directions, for a total of 6 per booster) would come back at liftoff pressure -- none of the tanks, right now, will be vented during SRB descent. The upshot is that, unless things change, the tanks will splashdown, at 60 MPH, every mission, with ~3000 psig or so residual pressure. If we lost one APU (the other is cross-strapped and would drive both actuators in the booster), half the tanks would come back at ~5000 psig (or even higher, if we raise the working pressure of the system). A point of info: the current single tank size is ~26" in diameter, ~3' in length, so we're talking a pretty healthy frontal area exposed to water impact loads.

Given my admittedly non-expert understanding of damage tolerance of COPVs (or lack thereof), I consider this to be a serious hazard to the recovery crews who will be in very close proximity to these damaged, pressurized tanks -- if, somehow, the tanks survive the initial impact -- given their propensity for stress rupture. I have included a set of charts that show just how close these recovery crews get to the tanks (these charts only show the divers, but there are obviously other ground crews that operate in similar proximity once the boosters are towed back to Hangar AF). To increase the pucker factor even more, there are some slight rumblings suggesting we make these COPVs reusable -- in my opinion, an even worse idea than not venting them in the first place.

Given the strict requirements of the COPV requirements in KSC's Safety Practices Handbook KHB 1710.2, this may ultimately be a non-issue (i.e., we may be forced to vent them during descent to meet the KHB req'ts), but am I overly concerned here? Maybe I'm off in left field, here. What are your thoughts and experiences? Would you recommend that these tanks be vented during descent? If we don't vent them, would you recommend making them reusable? Any advice you can give will be greatly appreciated!

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STS 102



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